

REMARKS

The Examiner's indication that all of the information items accompanying the Information Disclosure Statement of November 16, 2000 have been considered is greatly appreciated.

The Examiner's indication that Claims 23 and 24 would be allowable if rewritten as suggested in the Office Action is acknowledged and much appreciated. It is believed that these claims are allowable as currently written, as they depend from Claim 19, which is believed to be allowable for the reasons set forth below.

Claims 33, 34, 36, 37 and 39 have been amended to remove the "between"-type terminology in the recitation of a range. These amendments affect no narrowing of the claims, as a range lying between two numbers may be construed as not including the two boundary numbers, while a range from an approximate first number to an approximate second number is generally construed as including the first and second numbers. No new matter has been added by virtue of these amendments.

Claim 33 has been rejected under 35 U.S.C. Section 112, paragraph 2, as allegedly being indefinite. The rejection is believed to be moot in view of the amendment of Claim 33. As to the Examiner's comment regarding Claim 31, it is respectfully submitted that Claim 33 is independent of Claim 31, as is its definiteness.

Claims 19, 21 and 22 have been rejected under 35 U.S.C. Section 103(a) as allegedly being unpatentable over Reid *et al.* in view of Wright, Jr. and Chen.

Claims 25, 29-31, 33 and 34 have been rejected under 35 U.S.C. Section 103(a) as allegedly being unpatentable over Reid *et al.* in view of Wright, Jr. and Chen.

Claim 32 has been rejected under 35 U.S.C. Section 103(a) as allegedly being unpatentable over Reid *et al.* in view of Wright, Jr. and Chen, as applied to Claims 25, 29-31, 33 and 34 above, and further in view of Hubel.

Claim 35 has been rejected under 35 U.S.C. Section 103(a) as allegedly being unpatentable over Reid *et al.* in view of Wright, Jr. and Chen, as applied to Claims 25, 29-31, 33 and 34 above, and further in view of Combs.

Claims 36-38 have been rejected under 35 U.S.C. Section 103(a) as allegedly being unpatentable over Reid *et al.* in view of Combs.

Claim 39 has been rejected under 35 U.S.C. Section 103(a) as allegedly being unpatentable over Reid *et al.* in view of Combs, as applied to Claims 36-38 above, and further in view of Dubin *et al.*

All of these 35 U.S.C. Section 103(a) rejections are respectfully traversed. Reid *et al.* is disqualified as prior art under 35 U.S.C. Section 103(c), as it is a 102(e) reference, and its subject matter and the present invention were, at the time the invention was made, owned by the same entity or subject to an obligation of assignment to the same entity. Reid *et al.* was assigned to Novellus Systems, Inc., a California corporation, by virtue of an assignment submitted to the Patent and Trademark Office and recorded at Reel 9339, Frame 0032 et seq. The assignment was executed on July 20th and July 21st or 1988. The applicants herein were under an obligation to assign the subject matter of the present invention to Novellus Systems, Inc., at the time the original application Serial No. 09/410,170 was filed, namely, September 30, 1999. The claimed invention was assigned to Novellus Systems, Inc. by virtue of an assignment submitted to the Patent and Trademark Office and recorded at Reel 010345, Frame 0474 et seq. By virtue of the above-referenced assignments, the entire rights in the subject matter of Reid *et al.* and the subject matter of the present invention were conveyed to Novellus Systems, Inc. In view of the foregoing, it is believed that Reid *et al.* has been disqualified as prior art, such that these rejections under 35 U.S.C. Section 103(a) cannot stand.

As Reid *et al.* is disqualified as prior art, no response to the Examiner's statements concerning Reid *et al.*, or the alleged reasons for the 35 U.S.C. Section 103(a) rejections of the foregoing claims, is believed necessary herein.

In view of the foregoing, it is believed that the rejections under 35 U.S.C. Section 103(a) have been overcome.

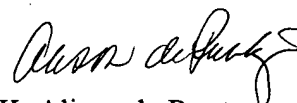
CONCLUSION

Claims 19-25 and 29-39 define novel and non-obvious subject matter of the present invention. It is believed that the application is in condition for allowance and an early notification to that effect is earnestly solicited.

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Respectfully submitted,



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Appendix: Claims Amended Herein, in Marked Form

33. (Amended) A method of electroplating as in Claim 29 wherein said second value of current density is [between about 0 and] up to about 5 milliamperes per square centimeter and increasing said current density from said second value is increasing said current density over a period of [between] from about 3 [and] to about 60 seconds to a maximum current density of [between] from about 4 [and] to about 45 milliamperes per square centimeter.

34. (Amended) A method of electroplating as in Claim 29 wherein said third value of current density is [between] from about 15 [and] to about 75 milliamperes per square centimeter.

36. (Amended) A method of electroplating a void-free copper layer onto a surface comprising a field region and a plurality of recessed features, the recessed features having a range of aspect ratios, the surface having a metal seed layer, the method comprising:

immersing said surface into an electroplating solution comprising copper ions, a suppressing additive, and an accelerating additive under conditions wherein an initial dc cathodic current density of [between] from about 0.1 [and] to about 5 milliamperes per square centimeter is applied to said surface to prevent dissolution of the seed layer;

maintaining said initial dc cathodic current density through said surface to create a substantially conformal conductive copper film having a thickness of about 500 Angstroms or less on said surface;

increasing said current density from said initial value to a second value wherein suppressing additives are preferentially depleted at the bottoms of recessed features having the highest aspect ratios such that electroplating deposition occurs preferentially on said bottoms, and maintaining the current density at said second value until said recessed features are filled to the extent that the aspect ratios of all of said recessed features are less than approximately 0.5; and

further increasing said current density to a third value providing a condition of rapid conformal plating, completely filling said recessed features and depositing a copper layer on said filled recessed features and said field region.

37. (Amended) The method of Claim 36 wherein said second value of current density is [between] from about 4 [and] to about 45 milliamperes per centimeter squared and said

third value of current density is [between] from about 15 [and] to about 75 milliamperes per centimeter squared.

39. (Amended) The method of Claim 36 wherein the range of aspect ratios is [between] from about 0.02 [and] to about 5.5.